



BILL O'HARA
LAND SURVEYOR

EST. 2016

TBPLS Firm Reg. #10194232

July 24, 2018

Dana Kirk, Attorney at Law
Kirk Law Firm, PLLC
440 Louisiana Street, Suite 2400
Houston, Texas 77002

Re: Gallo et al v. Union Pacific Railroad Company

Dear Mr. Kirk,

I was retained by your firm to provide surveying services to gather information in relation to the flood event which occurred on October 30, 2015 and impacted the Arroyo Doble subdivision near Manchaca, Travis County, Texas being the subject of the above referenced lawsuit. I was initially provided a list containing names, addresses and contact information for the parties being represented by your law firm in this lawsuit. In addition, I researched the Travis Central Appraisal District (TCAD) website to verify the data and notified your office that five of the properties listed had changed ownership. I also obtained copies of the subdivision plats for the pertinent sections of the Arroyo Doble development.

My mission for this project was threefold: collect survey data along and adjacent to the railroad tracks in the area where the breach of the railroad track embankment occurred October 30, 2015; locate water marks and other apparent evidence left by the flood waters on that date as shown to me by residents and personal observations; and, determine the elevation (as opposed to depth) of the floodwater at each of the houses involved in this lawsuit. As instructed, I called Dr. David Williams, PE, also working on this case as a consulting expert, to coordinate my survey work with his work. It was decided that surveyed points would be reported in Texas Coordinate System North American Datum (NAD) 1983 grid coordinates and the elevation would be based on the North American Vertical Datum (NAVD) of 1988. The data would be provided in a standard ASCII file type such as .txt.

I began my field work on April 10, 2018, and spent five days in the field on this project through May 1, 2018. During that time, I visited each address and attempted to contact the owners multiple times. Contact was made with several of the owners/plaintiffs on first attempt; others were contacted on subsequent attempts while collecting the field data; and, in several cases no contact was made with

the owners. Several of the owners had preserved the water marks in places such as a garage door, a screen door, an inside stairway, an inside wall, an outside deck, a mark on an outside air conditioning unit. These marks were shown to me and noted. Five of the households provided me with digital pictures and videos of the flood event and the aftermath. I did not observe any additional marks on my own such as drift material in trees, stains on fences, stains on house siding, or the like.

To begin my field survey work I established a network of horizontal and vertical control using a Leica GPS network rover. Horizontal positioning is based upon the Texas Coordinate System, NAD 83, Central Zone; the vertical datum is NAVD 88. I set random control points marked with 60d nails in strategic locations and occupied them with the GPS rover to obtain a position and elevation. Three published City of Austin control monuments were located and tied into the project control; horizontally my ties to the City of Austin control points were within two tenths of a foot of the published position and vertically the City control monuments were found to be 0.14', 0.23' and 0.24' below the project vertical datum utilizing the Leica network rover. I consider these results to be acceptable and attribute the difference in position and elevation on the fact that the City monuments were established 20 years ago and the geoid model used by the Leica Smartnet system is different and much improved since the late 1990's.

I then occupied the GPS control points with an electronic total station to measure angles and distances to corners of the subject houses in order to map their locations and footprints, and to determine the elevation of the top of their slab, also known as the Finished Floor Elevation (FFE), at the front door. Total station measurements were also made to verify differences in elevations between the control points. Lastly, differential leveling was run through the control points for further verification of the control. The leveling was also run to the front doors of the houses and in a few instances the garage door to determine the FFE.

In cases where I observed a water mark I measured up from the slab FFE to the water mark to determine its NAVD 88 elevation. In cases where I was provided a depth of water from the home owner, I added the depth to the FFE to determine the elevation of water inside the house.

In addition, the location of the breached railroad track embankment, repaired since the event, was pointed out to me by several residents of the neighborhood. The breach, reportedly about 100-ft wide, occurred on a stretch of the track which runs approximately 250-ft west of and parallel to Viento del Sur Street, approximately 100-200-ft north of the intersection of said Viento del Sur Street with

Whitetail Drive. I used the Leica network rover to collect survey data along the top of the rails and adjacent natural ground locations on both sides of the tracks.

My field data was compiled and analyzed by me in my office utilizing a survey software product by Traverse PC. Ultimately two ASCII .txt files were exported from the software program and delivered via email to Dr. Williams and your office; one of the .txt files contained a Point Number with Northing, Easting, WSEL (water surface elevation) and Description for a point at each address of the properties participating in this suit, and the other .txt file contained Point Number with Northing, Easting, Elevation and Description for the surveyed points along the railroad track. Copies of both the .txt files are enclosed with this report.

Notes pertaining to the .txt files:

Pt. No. 305, 600 Bear Canyon: the floor elevation of the garage is 643.78; a water mark on the inside of the garage door shown to me by the home owner measure 6-inches up from the bottom of the door for a water surface elevation of 644.28 feet. The garage door faces west and is therefore on the upstream side of the house from the floodwaters. The homeowner also stated the water level inside the house during the flood event was 3-inches. The finished floor elevation of the house is 644.41, therefore the water surface elevation inside the house would have been 644.66 feet. She did not say where inside the house the water reached that level.

Point Nos. 315 and 709, 13101 Viento del Sur: I was able to make contact with an owner of this house and he provided several printed photographs showing the flood event and aftermath and showed me a watermark still visible on the garage door, up 16-inches from the bottom of the door. The floor elevation of the garage at the door is 645.48 feet, therefore the water surface elevation at point number 315 is 646.81. The garage door faces west, the upstream side of the flood waters. The owner also reported that water was 8-inch deep inside the house. The finished floor elevation of the house is 646.22, therefore the water surface elevation inside the house at point number 709 was 646.88 feet. In addition, one of the pictures provided by the homeowner showed a water mark outside by the back door (east/downstream side of the house) 9-inches above the finished floor for a water surface elevation of 646.97 feet. See pictures pp. 13-14.

Point Nos. 334 and 826, 13203 Viento del Sur: this house is across the street from where the breach occurred and has been rebuilt since the flood event. The homeowner showed me a location outside at an upstream corner of the house closest to the street where the water had risen to. The mark is 3.5

feet above the concrete hardscape at that location. The water surface elevation of that watermark, point number 334, is 648.99 feet. The finished floor elevation at the front door is 645.94. The water depth during the flood event was reported to be 42-inches deep. The water surface elevation at point number 826 is measured at 649.44 feet.

Point No. 358, 13208 Viento del Sur: this house sits east of and adjacent to the railroad tracks approximately 250 feet south of the breach area. I talked to the owner but he did not have any preserved water marks to show me, much of the flood damage has been repaired. The finished floor elevation for this house at the front door is 648.76. Reportedly the water level inside the house during the event was 9-inches deep making the water surface elevation 649.51 feet.

Point No. 366, 412 Whitetail: see pictures provided by homeowner on pages 7, 8 and 9. This house faces south and is approximately 600 feet east of the breached area. According to the homeowner the water rose 39 inches inside the house. The finished floor elevation of the house is 644.88 feet; the water surface elevation inside the house was about 648.13 feet and outside at the garage door about 648.0 feet.

312 Horse Thief Trail: I did not make contact with the homeowners at this residence and did not observe any watermarks or evidence of the flood event.

13107 Viento del Sur: I did not make contact with the homeowners at this residence and did not observe any watermarks or evidence of the flood event.

Point No. 743, 314 Horse Thief Trail: see the attached pictures for images taken inside this house after the flood waters had receded. The home owner showed me a place on his living room wall (north wall of the house, inside) where the water had risen to 36-inches during the event. Point number 743 is in that position. The finished floor elevation of the house is 639.90 feet, therefore the water surface elevation was 642.90 feet.

Point No. 762, 13015 Stagecoach: I did make contact with this owner though he did not provide any pictures and did not have any preserved water marks from the flood event. He is a carpenter and had apparently repaired the damages. He did say that the water was 3-inches deep in his house during the event. The finished floor elevation at the front door is 621.40 feet, therefore the water surface elevation inside his house was 621.65 feet.

13205 Viento del Sur: I did not make contact with the homeowners at this residence and did not observe any watermarks or evidence of the flood event. This house is across the street from the breached area.

Point No. 846, 13106 Viento del Sur: I did make contact with a young male teenager who lives in the house and he told me they had a small amount of water, perhaps a few inches, in the house from the flood event. Otherwise I did not observe any watermarks or evidence of the flood event. The finished floor elevation at the front door is 648.86 feet. Using a water depth of 3 inches inside the house during the flood event, the water surface elevation would be 649.11 feet. The back (west side) of this house faces the railroad tracks but is approximately 400 feet north of the breached area.

13003 Viento del Sur: I did not make contact with the homeowners at this residence and did not observe any watermarks or evidence of the flood event.

Point No. 850, 601 Bear Canyon: I had a brief encounter with the owner of this property; he showed me a water mark on the outside unit of his air conditioner. The mark is about one foot above the ground on the east/downstream side of the house. Point number 850, the water mark on the AC unit, has a water surface elevation of 645.60 feet.

13202 Viento del Sur: this house is directly east of and adjacent to the location of the railroad tracks where the breach occurred. I made several attempts to contact the homeowners but to no avail.

Point No. 1001, 404 Whitetail: I made contact with the homeowner and he took me inside the house to show a watermark on a carpeted stair. The water surface elevation at that point number 1001 is 643.85 feet. I did not observe any outside marks.

Point Nos. 378 and 1002, 407 Whitetail: the owners of this house told me the water level was 54-inches at their front door and 34-inches inside the house during the flood event. Their front door facing north is on the upstream side. Point number 1002 is a position inside the house with a water surface elevation of 644.90 feet. Point number 378 is the front door with a water surface elevation of 646.47 feet.

Point No. 1003, 408 Whitetail: the owner of this house told me the water was 3.5 – 4 feet deep inside the house during the event. This point is in the middle of the house. The finished floor elevation is 642.52 feet and the water surface elevation therefore was 646.52 feet.

500 Whitetail: I did not have any contact with the owners of this house and did not observe any watermarks on the outside.

Point No. 1005, 502 Whitetail: I had contact with an owner (the husband) of this property but he and his wife were very much impacted by the flood event and he did not want to talk about it and preferred we not do any surveying on his property. He did tell me the water rose to 3-feet deep during the flood event. I was able to acquire enough data to determine the location and footprint of the front of the house and the finished floor elevation at the front door of 647.37 feet. Using a water depth of 36-inches renders a water surface elevation of 650.37 feet during the event. This house is also directly across the street from the breached area of the railroad tracks.

Point No. 1006, 507 Whitetail: the back of this house faces the railroad tracks several hundred feet south of the breach area. I talked with the owners; they did not show me any water marks from the flood event but did say the water depth was about 8-inches during the event. The finished floor elevation is 648.70 and the water level was 8-inches yielding a water surface elevation of 649.37 feet.

Point No. 1007, 13201 Viento del Sur: after several attempts I made contact with an owner of this house; she showed me a water mark on the hot water closet in their garage. The water surface elevation of this point was determined to be 649.16 feet. The garage door faces south and the water heater is 10-feet inside the garage.

13109 Viento del Sur: I was unable to make contact with the owners of this house. I did not observe any water marks on or around this house.

Point Nos. 1009 and 1010, 13200 Viento del Sur: the back of this house faces the railroad tracks in the area of the breach. I finally made contact with the owners of this house and they provided pictures of the flood event and showed me how high the water rose inside the house and at the back door. They said the water rose about 3-feet at the back door and about 18-inches inside the house. Point number 1010 is the back door, on the upstream side of the house, with a water surface elevation of 650.57 feet. Point number 1009 is inside the house, the water surface elevation being 649.07 feet.

410 Whitetail: I did not have any contact with the owners of this house and did not observe any watermarks on the outside.

Pictures are enclosed with this report on pages 8 - 16.

This concludes my report of work conducted by me for this case. Please do not hesitate to contact me concerning questions or concerns about this report and the work performed.

Respectfully submitted,

William D. O'Hara

William D. O'Hara

Registered Professional Land Surveyor No. 4878

State of Texas



Enclosures:

Pictures pages 8-16

ASCII.txt files pages 17-19

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Copy of ASCII file in comma delimited format; point positions with water surface elevations

Pt#, Northing	Easting	WSEL	Description Address
305,10018459.638,	3087730.456,	644.28,	600 Bear Canyon, inside garage door upstream side
315,10018124.140,	3087640.632,	646.81,	13101 Viento Del Sur, inside garage door upstream side
334,10017407.550,	3087679.409,	648.99,	HC,13203 Viento Del Sur
358,10017077.687,	3087540.514,	649.51,	HC,13208 Viento Del Sur
366,10017137.570,	3087966.235,	648.13,	Front door,412 Whitetail
378,10016973.952,	3088382.685,	646.47,	407 Whitetail outside front door upstream side
709,10018104.389,	3087646.833,	646.88,	near front door 13101 Viento Del Sur
743,10016719.351,	3088390.080,	642.90,	314 Horsethief Tr.
762,10016972.067,	3089535.526,	621.65,	13015 Stagecoach
826,10017407.151,	3087710.812,	547.61,	13203 Viento Del Sur inside front door upstream side
846,10017792.579,	3087524.710,	649.11,	13106 Viento Del Sur
850,10018303.389,	3087698.263,	645.60,	Watermark,601 Bear Canyon, outside AC unit downstream
1001,10017131.697,	3088424.356,	643.85,	404 Whitetail
1002,10016960.010,	3088388.898,	644.90,	407 Whitetail
1003,10017141.109,	3088178.382,	646.52,	408 Whitetail
1005,10017183.994,	3087704.876,	650.37,	502 Whitetail
1006,10016939.923,	3087538.651,	649.37,	507 Whitetail
1007,10017486.101,	3087695.758,	649.16,	13201 Viento Del Sur
1009,10017504.155,	3087523.731,	649.07,	13200 Viento Del Sur inside
1010,10017494.006,	3087509.492,	650.57,	13200 Viento Del Sur outside

Note: HC = House Corner

ASCII file of surveyed points along railroad tracks and adjacent natural ground

Pt#	Northing	Easting	Elev	Description
200	10016559.360	3087372.954	657.61	TOP RR RAIL W
201	10016660.170	3087319.729	652.93	NG FNC
202	10016661.680	3087340.103	651.90	GND
203	10016665.600	3087367.079	657.11	TOP RR RAIL W
204	10016769.310	3087361.372	656.64	TOP RR RAIL W
205	10016771.530	3087344.013	651.17	GND
206	10016771.500	3087314.331	652.01	NG FNC
207	10016865.660	3087340.610	651.63	GND
208	10016865.290	3087355.868	656.27	TOP RR RAIL W
209	10016974.050	3087350.093	655.86	TOP RR RAIL W
210	10017083.580	3087344.064	655.34	TOP RR RAIL W
211	10017193.650	3087337.985	654.69	TOP RR RAIL W
212	10017300.470	3087331.986	654.16	TOP RR RAIL W
213	10017299.450	3087316.492	651.08	GND
214	10017395.710	3087313.360	650.58	GND
215	10017397.260	3087327.010	653.66	TOP RR RAIL W
216	10017510.830	3087320.816	653.36	TOP RR RAIL W
217	10017616.990	3087315.034	653.03	TOP RR RAIL W
218	10017722.040	3087309.510	652.93	TOP RR RAIL W
219	10017721.710	3087293.437	649.03	GND
220	10017822.760	3087303.702	652.57	TOP RR RAIL W
221	10017822.930	3087308.747	652.55	TOP RR RAIL E
222	10017823.740	3087324.211	649.57	GND
223	10017718.980	3087329.062	649.53	GND
224	10017717.190	3087314.570	652.80	TOP RR RAIL E
225	10017607.380	3087320.518	653.13	TOP RR RAIL E
226	10017605.480	3087355.553	650.73	GND
227	10017605.560	3087320.560	653.05	TOP RR RAIL E
228	10017502.200	3087326.240	653.37	TOP RR RAIL E
229	10017497.320	3087360.106	649.63	GND

230,10017434.360,3087359.978,649.47,GND
231,10017382.840,3087332.814,653.72, TOP RR RAIL E
232,10017381.370,3087367.180,649.26,GND
233,10017329.680,3087365.266,648.35,GND
234,10017303.340,3087367.846,648.40,GND
235,10017300.550,3087337.269,654.14, TOP RR RAIL E
236,10017204.540,3087342.731,654.59, TOP RR RAIL E
237,10017124.800,3087347.078,655.06, TOP RR RAIL E
238,10017018.900,3087352.826,655.61, TOP RR RAIL E
239,10016900.380,3087359.146,656.14, TOP RR RAIL E
240,10016795.730,3087364.978,656.52, TOP RR RAIL E
241,10016699.240,3087370.162,656.97, TOP RR RAIL E
242,10016558.420,3087377.904,657.58, TOP RR RAIL E
243,10016625.400,3087403.537,651.66,GND
244,10016732.980,3087399.549,649.46,GND
245,10016892.570,3087398.297,648.87,GND
246,10016987.430,3087392.692,648.19,GND
247,10017121.140,3087388.068,648.02,GND
248,10017233.830,3087383.327,647.51,GND